

WARM UP: #4 from notes yesterday

4) Portable personal computers, or "laptops," represent a fast-growing segment of the PC market. According to Market Intelligence Research company, the use of laptops can be classified in the following user segments ("Laptop's Three Musts," 1988): Business-professional (69%), Government (21%), Education (7%), and Home (3%). 200 laptop owners were surveyed this year, and the user segments were tabulated as follows: Business-professional (102), Government (32), Education (22), and Home (44). Do the data provide sufficient evidence to indicate that the figures given in 1988 are not accurate today?

#4:

Ho: the distribution of use of laptops fits the given percents
Ha: the distribution of use of laptops doesn't fit the given percents

Conditions:

- | | |
|-----------------------------|---|
| 1) categorical | 1) the type of laptop owners are categorical |
| 2) SRS | 2) assumed representative |
| 3) expected counts ≥ 5 | 3) all expected counts ≥ 5
(138, 42, 14, 6) |

conditions met $\rightarrow \chi^2$ distribution $\rightarrow \chi^2$ GOF test

$$\chi^2 = \sum \frac{(\text{obs} - \text{exp})^2}{\text{exp}} = \frac{(102 - 138)^2}{138} + \frac{(32 - 42)^2}{42} + \dots = 257.01$$

$$P(\chi^2 > 257.01 | df = 3) = 1.993 \times 10^{-55}$$

We reject Ho b/c p-value of $1.993 \times 10^{-55} < \alpha = 0.05$.
We have sufficient evidence that laptop use does not fit the given percentages

HW: p. 643 #4, 5, 7

#4

	L_1 Obs	Exp %	L_2 Exp #
Y	29	20%	21.2
R	23	20%	21.2
O	12	10%	10.6
Bl.	14	10%	10.6
G	8	10%	10.6
Br.	20	30%	31.8
	<u>106</u>		

Ho: The distribution of M&M's is as specified by the company

Ha: The distribution of M&M's is not as specified by the company

Conditions:

- | | |
|---------------------------------|---|
| 1) Categorical data | 1) Color of M&Ms is categorical |
| 2) SRS | 2) Assume bag is representative of all M&Ms |
| 3) all expected counts ≥ 5 | 3) 21.2, 10.6, 31.8 ≥ 5 |

conditions met $\rightarrow \chi^2$ distribution $\rightarrow \chi^2$ GOF test

Mechanics:

$$\chi^2 = \sum \frac{(\text{obs} - \text{exp})^2}{\text{exp}} = \frac{(29-21.2)^2}{21.2} + \frac{(23-21.2)^2}{21.2} + \dots$$

$$= 9.3144$$

$$P(\chi^2 > 9.3144 | df = 5) = 0.0972$$

We fail to reject H_0 b/c p-value of $0.0972 > \alpha = 0.05$.
We have insufficient evidence that the bag of M&Ms is unusual. There is evidence that the bags are being filled properly.

5) (a) the χ^2 is not appropriate because the data is not categorical. Weights are quantitative.

(b) We could count the # of each nut in the can. Then we could use the χ^2 test.

7) Find observed counts by multiplying $26,181 * \%$ of each police officer race and rounding to nearest whole #

	<u>Observed</u>	<u>Expected</u>
White	16965	7644.852
Black	3796	7383.042
Latino	5001	8247
Asian	367	2382.471
Other	52	523.6

H_0 : The distribution of races of police officers fits the distribution of races of NYC population

H_a : The distribution of races of police officers does not fit the distribution of races of NYC population

Conditions:

1) Categorical data

1) races are categorical

2) SRS

2) Assume sample is representative of all police officers

3) all expected counts ≥ 5

3) all expected counts ≥ 5
(see list written above)

conditions met $\rightarrow \chi^2$ distribution $\rightarrow \chi^2$ GOF test

$$\chi^2 = \sum \frac{(\text{obs} - \text{exp})^2}{\text{exp}}$$

$$\chi^2 = \frac{(16965 - 7644.852)^2}{7644.852} + \frac{(3796 - 7383.042)^2}{7383.042} + \dots =$$

$$\chi^2 = 16512.745$$

$$P(\chi^2 > 16512.745 | df = 4) = 0$$

We reject H_0 b/c p-value of $0 < \alpha = 0.05$.
We have sufficient evidence that the distribution of races of police officers does not fit the distribution of races of NYC.